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FINAL REPORT FOR RESEARCH AGREEMENT

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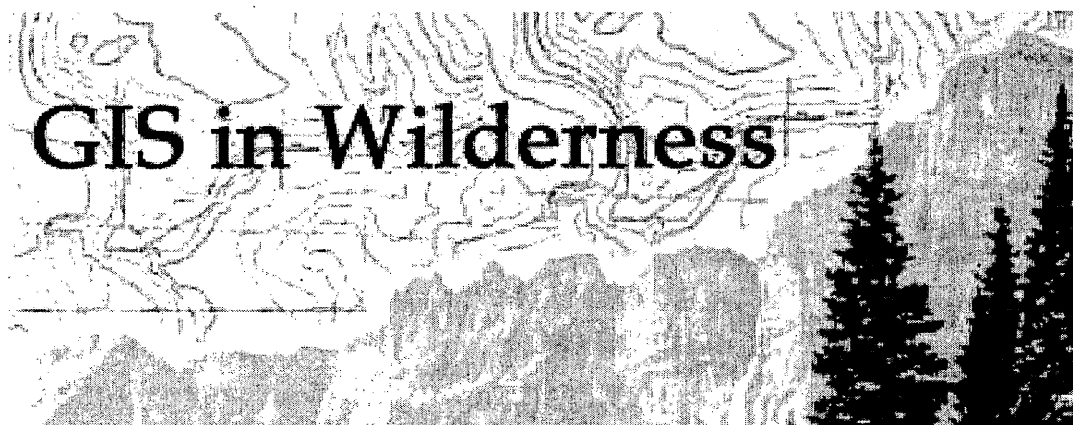
"Development of a Meta-Web Site for GIS and
Wilderness"

UNIVERSITY OF MONTANA

FS Contact: Mr. Peter Landres

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A Summary Paper of the GIS in Wilderness Web Site Project



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Abstract:

There are many challenges in Wilderness management today. Underlying many of these challenges is the issue of space; not enough to accommodate the needs of human users, not enough to accommodate wildlife, and not enough to accommodate the resource. As a result, Wilderness management is moving more into the role of conflict management. Geographic Information Systems (GIS) are an available tool to help mediate spatial conflicts. Whether or not this tool is appropriate for Wilderness management is a question that must be asked within different contexts. The Wilderness Act's dual mandate makes it important to consider the legal, philosophical and logistical context. The GIS in Wilderness project sets up the framework for this discussion. This framework was based on the completion of a needs assessment that included representation of the National Parks Service, U.S. Fish & Wildlife, U.S. Forest Service, professors from various Universities and some of the major Wilderness Non-profit organizations. By defining the context of Wilderness and the capabilities of GIS as a decision-making tool, we set the stage for the discussion of GIS as an appropriate tool for Wilderness management.

The Foundation of the Project:

Peter Landres of the Aldo Leopold Wilderness Research Institute was interested in creating a web site that looked at the use of GIS for Wilderness management. Peter contacted Lloyd Queen, remote-sensing/GIS professor with School of Forestry, about developing a meta-website dealing with the issues of using GIS for Wilderness management. From there Lloyd worked with Wayne Freimund, recreation management/wilderness professor with School of Forestry, to establish a group of students to work on this project. The group consisted of Micheal Montemeyer an undergraduate in Forestry who specialized in the use of GIS, Dave Lefevre and Ash Shepherd undergraduates in the Recreation Resource Management program with an emphasis in Wilderness Studies, and Ann Mayo a graduate assistant within the Recreation Management Department. Wayne Friemund and Lloyd Queen served as visionaries and advisors to the group. Together they represented the two sides of the discussion of technology in Wilderness. As a whole, the group broadly intended to improve the connection between GIS technology and Wilderness. Professionals with different perspectives were pooled together to establish a common dialogue.

This discussion is founded in the challenge of bridging the gap between the people who develop the scientific tools for resource management and those who apply

this technology in the field. New technology develops rapidly with vast potential for application to land management. However, a gap remains between technicians and managers. The result is that the new developments are not always useful or easily understood by land managers. At the same time, developments in technology are not being used to their fullest potential to improve land management. The necessary dialogue lacks mediation, someone or something to serve as a common ground for the two sides of the discussion. The GIS in Wilderness web site project serves as forum for common ground, specifically for the topic of applying GIS to Wilderness management.

Determining Content and Design

The first step toward outlining the content and design of our web site was to conduct an inventory of the internet, to capture the type, extent, and quality of information that is already available electronically. We searched for sites that pertained to the Wilderness and GIS concepts, particularly those that included discussion of their intersection. After searching for anything in respect to Wilderness, wildlands, GIS, and spatial analysis, we began to establish where our niche would be amongst Internet resources.

We found that the web offers countless resources that are relevant to the two concepts, Wilderness and GIS, in many different contexts and with variable quality, but there is little information provided about their integration. Excluding a few technical publications and project outlines, little could be found about using GIS specifically for Wilderness management.

WILDERNESS - Our findings ranged from anti-wilderness ORV interests to extreme environmental activism. Federal land management agencies, academics, commercial travel and tourism operations were all represented.

GIS - Information about GIS is readily available on the web, in the form of data providers, GIS tutorials, academic interests, and research publications.

While information is available on the two separate subjects, examples of the collaboration of the two ideas were extremely limited. The Wilderness context often seemed too philosophical, and the GIS information was overly technical and often software specific. This inventory clarified a potential niche for our site, where the concepts of GIS and Wilderness are described in simple terms and graphical presentations demonstrating their integration.

The visual presentation of the GIS concept is crucial to its relationship to Wilderness management. However, only when the maps and their corresponding databases are used together will the capabilities of GIS be understood. An illustration of the Wilderness context is equally important. Thus, a crucial part of our project is to show the connectivity and communicative properties of GIS and its relationship to Wilderness management. By walking through a series of real-world applications, with reference to their mapping and database manipulation capabilities, we provide a simple visual and written explanation of the ways in which GIS can and has been used in the Wilderness context. We identified five primary uses for GIS in wilderness management, which we intend to visually represent: inventorying, monitoring, planning, analysis, and communication. We will also link to outside sources of information; existing sites, references, related publications, and similar interests. By combining existing resources into one cohesive Wilderness/GIS web site, we fill an empty niche in available Internet resources.

Discovering what information is already available is half of the process, but determining the need of the end-users establishes what is important to provide with a GIS and Wilderness web site.

Needs-Assessment

Before getting too caught up in our own interpretation of the problems and solutions, we decided we must consult our target audience. We narrowed our target audience to include Wilderness managers, GIS specialists, respective academia, and NGO's. Through an informal electronic questionnaire, we gained feedback about the needs of our diverse audience. The survey is included as Appendix A. The results are as follows. The responses we received clarified the need for specific examples of applications, information about trainings, and also highlighted some of the major issues surrounding GIS use or nonuse.

Surveys were sent to representatives of our target audience. A small number were returned by professors and NGO's, with a higher response rate from federal land managers. We feel that the low response rate from professors and NGO's was due to their lack of focus on the intersection between wilderness and GIS. A higher return rate from managers may be due to the fact that these people are currently working in the intersection, and struggling with the role of GIS.

What We Found

- ❖ People wanted to see real-world examples of applications that have worked in the past, or options that are currently being investigated. For example, Inventory and

monitoring examples, wildlife interactions, fuel modeling, trail and site planning, and scenario building.

- ❖ Most respondents are making decisions or studying management strategies, which require spatial analysis.
- ❖ The majority of respondents indicated a moderate or higher understanding of the capabilities of GIS.
- ❖ Many people are using GIS. However, most are not using GIS to its full analysis potential. This is partly due to the lack of accurate or compatible baseline data.
- ❖ Most organizations offer training in GIS and Wilderness management, but lack staff and funding to utilize this opportunity to fully integrate GIS into their management planning.
- ❖ A small number of respondents recognized a philosophical conflict between Wilderness and technology, and felt that it should be addressed in the web site.

An end product of the Internet inventory and needs-assessment was the clarification of a mission statement:

(1) To stimulate a dialogue between people involved with GIS technology and those involved with issues of wilderness management, (2) facilitate a shift in the thought process used to address the challenges of wilderness management and (3) offer a means of sharing resources relevant to both GIS and wilderness.

Pro's and Con's of the Project

Any project will have certain advantages and disadvantages associated with its development and completion. This project is not different. However, the benefits and consequences of this project extend beyond the environment of our specific scope, to potentially alter the effectiveness and efficiency of Wilderness management as a whole.

The GIS in Wilderness web site has the potential to provide a stepping stone onto the platform of discussion between Wilderness and GIS professionals. Keeping in mind the potential limitations of using GIS, our site is designed to inform visitors not only of the far reaching benefits, but also of the precautions that should be taken when implementing a GIS program.

Pro's of the Project

- Improved understanding, communication, and cooperation between Wilderness and GIS professionals.
- Promotion of a new way of thinking, which combines visual (mapping) elements with data files (databases), to provide in depth analysis of resources and their relationships to each other.
- Provision of and understanding that will spark a greater interest and motivation to seek training in GIS and/or Wilderness, within agencies; academic institutions, NGO's, and individuals.
- The creation of a valuable reference that is written in common language, for use by managers, students, etc., who are trying to understand the concepts and their integration.
- Improved Wilderness stewardship, as a result of management informed of available resources.
- In an age of rapid electronic information our site will respond to the demand for easily accessible information on the Internet.

Con's of the project

- Those people who are not computer savvy or do not have access to a computer with Internet capabilities, will not receive our message.
- Using GIS may result in decisions based on inaccurate data. Accurate baseline data must first be developed, before well-informed management decisions can be made.
- There is always the ongoing debate between technology and Wilderness. Some people will continue to oppose the use of GIS technology for Wilderness management.
- Currently this site is static. Due to lack of funds and continued staffing, our site does not have a webmaster. Therefore, our site cannot adjust or react to changing needs of the end-users.

Recommendations:

The GIS in Wilderness web project fills a very unique niche. From what we discovered in our inventory and needs assessment, there is a missing component in the discussion about technology for Wilderness Management. That component is an easily accessible example of the intersection between the fields of GIS and Wilderness management. The strength of this web page will be in creating a common understanding and dialogue between the different interests involved in GIS and Wilderness management.

We hope that as the larger discussion of GIS in Wilderness develops, the GIS in Wilderness web page will need to be equally dynamic. In order for this to happen we feel there are five things that need to happen:

1. Addition of a glossary of GIS terms developed by Lloyd P Queen.
2. An updating process of the applications section of the web page in order to properly reflect current examples of ways that GIS is being used by Wilderness Managers. This will maintain the site as a dynamic source of information and education. This will also encourage end-users to return to the site and stay involved with development of the discussion of GIS for Wilderness management.
3. A form of facilitated dialogue on the site. This can be done with a bulletin board, a listserver, a chat forum or another active monitoring and facilitation component. The purpose of this would be to actively engage and facilitate the discussion of GIS in Wilderness management between agency, academic and non-profit end-users.
4. Encourage comments and contributions to the site. This would require a webmaster in order to manage incoming information and requests. A second aspect of this recommendation is a survey that would act as a monitoring system. This monitoring system allows the page to be reactive to the changing needs of the end-users and the larger discussion of GIS for Wilderness management.

5. A section where people can post information about up-coming trainings, conferences, workshops, or relevant publications. This will encourage cooperation and communication among the different sub-populations of the target audience.

These suggestions are designed to help the GIS in Wilderness project better achieve its mission statement. They all strive to improve the web page's ability to encourage and facilitate the dialogue between all parties involved or concerned with the topic of Wilderness management.

acknowledgments:

We thank Peter Landres, Research Ecologist at the Aldo Leopold Wilderness Research Institute, for initiating this project and his moral support throughout its tenure. We greatly appreciate funding from the Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, USDA Forest Service.

Appendix A

(Person writing to),

The Aldo Leopold Wilderness Research Institute and the University of Montana are undertaking a project to develop a website that addresses the issues of using GIS as a tool for Wilderness Management.

In an effort to be comprehensive and complete, we are currently in the process of completing a needs assessment. The results from the needs assessments will help us determine the content type and depth for the website. You have been contacted, because we feel you represent a critical perspective on the potential of GIS, Wilderness Management, Research and Education.

Please take a few minutes to complete our e-mail survey. If you have any further questions please feel free to contact me at your convenience. Thank you for your time and valuable input.

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Questionnaire

Instructions: Please reply to this message and include the original text when you fill out the questionnaire. To record your answers put the cursor next to the "A:" and type. If this message was forwarded to you, please make sure you reply to the e-mail address listed above, and not to the person who forwarded it to you. ***Thank you for your time.***

Q1) What is your Occupation?

- a) Researcher
- b) Manager/Planner
- c) Professor
- d) Student
- e) GIS technician
- f) Other (Please explain)

A1:

Q2) Please rate and briefly explain your familiarity with the functions of GIS.

Very Unfamiliar(1)	Very Familiar(5)
1 2 3	4 5

A2:

Appendix A

Q3) If you use GIS, which of the following best describes how?

- a. Map making
- b. Tracking change over time
- c. Site selection
- d. Querying your database to address spatial relationship issues.
- e. Monitoring/Inventory
- f. Scenario-building
- g. Other (Please explain)

A3: (Please list all that apply)

Q4) What type of examples and information about GIS applications would be useful to you and/or your colleagues, to help better understand the role that GIS can play in Wilderness Management?

A4:

Q5) Does your organization/institution offer education/training for GIS? Please provide an example.

A5:

Q6) Does your organization/institution offer education/training about Wilderness Management? Please explain.

A6:

Q7) Within your field, how likely are you to address issues that deal with spatial relationships?

Never (1)		Very Likely(5)		
1	2	3	4	5

A7:

Q8)) If you are currently using GIS, what were some of the obstacles you had to overcome to incorporate it into your existing system?

A8:

Q9) If you do not currently use GIS, what methods do you use to analyze spatial concerns?

(Examples: mapping by hand, storing databases in unconnected files, etc.)

A9:

Q10) Please rate the level of difficulty that you perceive in incorporating GIS into your current system of dealing with spatially related issues? If a 1 or 2, please explain why so difficult.

Very Difficult(1)			Very Easy(5)	
1	2	3	4	5

Appendix A

A10:

Q11) What downfalls do you perceive to using GIS for Wilderness Management that should be illustrated on a website about GIS and Wilderness Management?

A11:

Q12) Do you feel that a website that discusses the role of GIS in Wilderness should include an explanation of the legal foundation of Wilderness and its implications for management?

A12:

Q13) Do you know of anyone else (Wilderness Managers, Researchers, Technicians, etc.) who would be helpful, or interested in participating in our Needs Assessment? If so, feel free to forward this message on or include their contact information below (preferably e-mail addresses).

A13:

We thank you for your time and cooperation.

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